# WRC-CANX
# CAN Bus Extender
# Series 3
# User's Manual

**Western Reserve Controls, Inc.**

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# 1. Overview

The WRC-CANX Extenders is a family of products that extend the communications cable lengths for DeviceNet, SDS (Smart Distributed System), CANopen and other CAN, V2.0, Part A or Part B serial bus systems. By allowing the user to extend the bus length for any given speed, they assist the user in cost-effectively implementing I/O or other nodes on these buses at remote locations that would be more difficult or more expensive to do otherwise.

A WRC-CANX Extender (the family members collectively referred to here as CANX or Extender) can be connected in a bus trunk line or drop line and is transparent to the other nodes on the bus. It receives and actively re-transmits (store-and-forward) each message from either side of the network without interpreting the message or acting upon it.

Each product has two network interfaces with an electrical isolation path between the two. Power is delivered to the unit through the network connectors. For DeviceNet and SDS systems power is provided through the 5-conductor bus cable.

A CANX can be used for quite a number of helpful purposes, including

- to extend the network beyond its absolute maximum length (e.g., 500 meters for DeviceNet) at the slowest speed
- to implement a longer network for a given baud rate (e.g., pushing a 500K baud network beyond 100 m for DeviceNet)
- to provide higher speed baud rates for a given network length
- to extend the length of the drop cable (e.g., longer drops than 6 m for DeviceNet)
- to provide 2600V electrical isolation between the 2 sub-nets
- to create a unique network topology instead of a conventional bus structure, such as a star configuration

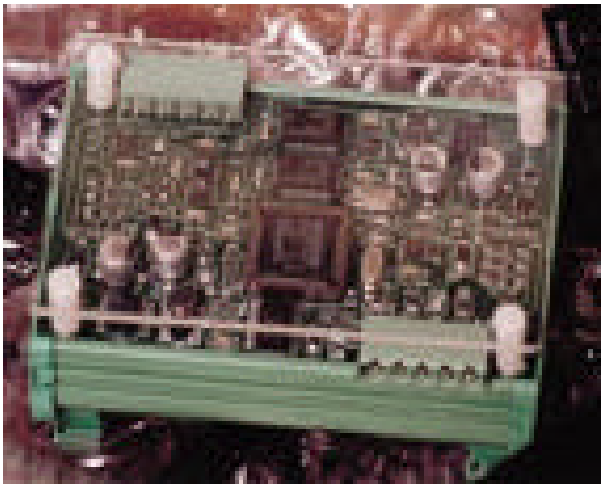

Figure 1-1 WRC-CANX-DIN-DN Series 3

Figure 1-2 WRC-CANX-NEM-DN Series 3

## 1.1. Series 3 Specific Features

The Series 3 products provide enhancements over previous versions. Enhancements include:

- CAN 2A and 2B support
- Up to 1M Baud CAN bus operation available
- Jumper-selectable terminating resistors on-board the CANX
- Increased message internal buffers

## 1.2. Features

The WRC-CANX has the following features:

- Extends CAN-Bus cable lengths - trunk line or drop lines
- Allows bus operation at higher speeds for specific distances
- Expands the usable applications for CAN-Bus systems
- Operates at 125K, 250K and 500K baud on DeviceNet
- Operates up to 1M baud for other CAN protocols
- No configurable parameters
    - Automatic baud rate selection
    - No address selection required
- Isolates the two sides of the bus - 2500 volts
- Logically transparent to the Master and Slave devices on the bus
- DeviceNet; SDS; CAN, V2.0, Part A and Part B compatible
- Powered from the 24Vdc supplied by bus network or the user
- Two mechanical packages:

| | |
|---|---|
| DIN rail mount: | WRC-CANX-DIN |
| Sealed NEMA-4X enclosure: | WRC-CANX-NEM |

- 5-pin pluggable connection for the DIN mount unit
- 5-pin round mini-style connection for the NEMA mount unit
- Standard CAN chips manage bus error detection
- Standard CAN chips handle message bus contention

- Less than 500 µsec latency
- 4 bi-color (red/green) status LED's
- CE Compliant for WRC-CANX-NEM-xx versions
    - EN 55011 Class A
    - EN 50082-2: 1994

## 1.3. Basic Operation

There are two bus connections for each CANX, referred to as Network A and Network B. The CAN Bus is connected to each side of the CANX and each side receives its power and signals from the Bus on its respective side. See

Figure **1-3** for a typical application.

Whenever a message is transmitted on the Bus to which CANX is connected, CANX receives the message on the side where it was initiated and performs a store-and-forward of the message to the other side. It then transmits the message to the bus on the other side, following the defined bus arbitration rules. This action is performed for any valid CAN message independent of who generated it or to whom it is intended.

There is approximately a 75 µsec propagation delay of the message through the CANX.

The CANX is not addressed as a specific device on the Bus and cannot be interrogated by other nodes. It is transparent to all other nodes on the bus.

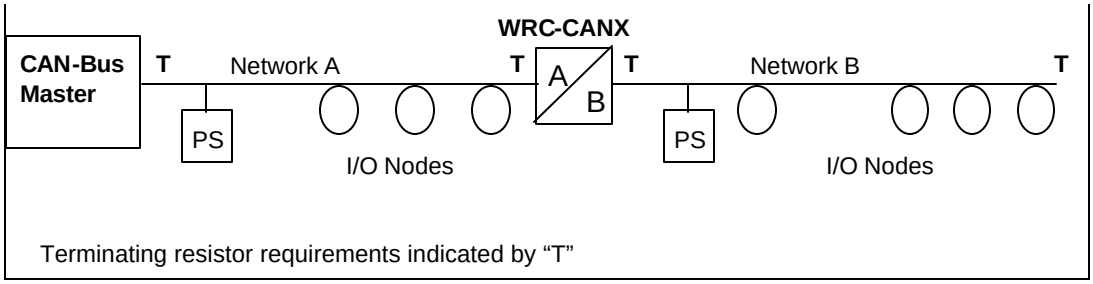


Figure 1-3 Typical CANX network configuration

## 1.4. Ordering Options

Several options are available, depending upon which bus network is used and which package choice is desired.

Table 1-1 CANX Ordering Options

| Bus Network | DIN Mount | NEMA Enclosure |
|---|---|---|
| DeviceNet | WRC-CANX-DIN-DN Series 3 | WRC-CANX-NEM-DN Series 3<br>WRC-CANX-NEM-AU Series 3 |
| SDS | WRC-CANX-DIN-SD Series 3 | WRC-CANX-NEM-SD Series 3 |
| Other CAN Bus | WRC-CANX-DIN-CU Series 3 | WRC-CANX-NEM-CU Series 3 |

## *1.5. Reference Documents*

The following documents are referenced in this User's Manual

- ODVA DeviceNet Specification Volume I, Release 2.0
- Honeywell Micro Switch Specification GS 052 104, "SDS Smart Distributed System Physical Layer Specification", release date 12/8/1994

# 2. Using This Manual

This manual serves to help the user to understand the capabilities of the CAN-Bus Extender product family and how to install and configure an I/O subsystem using these products.

Section 3 describes how to quickly connect your WRC-CANX and get it up and running on the DeviceNet, SDS or other CAN-Bus link.

Section 4 provides the technical specifications for the products.

Section 5 describes the installation of the hardware, including mounting, cabling, connection to other I/O subsystem components, and power requirements.

Section 6 provides some additional operational information.

Section 7 provides some example applications and network topologies.

Section 8 lists common accessories that are used with the WRC-CANX.

Section 9 provides some troubleshooting hints in the event your CAN-Bus Extender is not operating as anticipated.

Section 0 summarizes the changes to the Series 3 family compared to the previous Revision 2.xx products.

# 3. Quick Start

To quickly and easily install your CAN-Bus Extender in your DeviceNet system, follow the instructions below. For more details, see Section 5.

**To Install and Establish Communications**

1. Remove the CAN-Bus Extender from the box and connect your CAN-Bus cable to the 5-pin plugs (supplied with CANX-DIN) or the mini-style connectors (user-supplied) according to wiring specifications for the CAN Bus you are using and described later in this manual.
2. Leave the DIP switches in the FF or all OPEN positions. The DIP switches are set to autobaud both A and B sides from the first valid CAN message on either side.
3. Using on-board jumpers W1 and W2, terminate each side of the CAN-Bus network, as appropriate. (This is especially critical at the higher baud rates.)
4. The CANX does not differentiate between A side and B side from a functional perspective. The CANX can be oriented with either side toward the Master.
5. Make sure that there is power on both network sides. (The CANX isolated power and signal.)
6. Plug the CANX into your network.
7. The CAN-Bus Extender will undergo its initialization sequence, flashing the LED's. After approximately 5 seconds, the Module Status LED (labeled "MS") will go on solid green and network LED's (labeled "NSA" and "NSB") will flash green.
8. Both Network A and B Status LED's (NSA and NSB) will go on solid once a valid CAN message is received into either side of the Extender and the baudrate auto-detect has been successfully performed.
9. The CAN-Bus Extender is now operating on the network and is ready to repeat messages from either Network A or Network B.

# 4. General Specifications

| | | | |
|---|---|---|---|
| **Product**: | WRC-CANX-DIN and WRC-CANX-NEM CAN-Bus Extender, Series 3 | | |
| **Description**: | Electrical extender to extend the permitted cable distances defined for CAN-based network products | | |
| **Device Type**: | Communications Extender | | |
| **Product Revision**: | 3.xx | | |
| **DeviceNet Conformance**: | Designed to conform to the ODVA DeviceNet Specification Version 2.0. | | |
| **Baud rate**: | 125K, 250K, 500K - automatic selection | | |
| **Address selection**: | Not applicable | | |
| **Bus Connection**: | WRC-CANX-DIN | | |
| | Extender: | 5-pin pluggable header (male pins)<br>Phoenix Contact MSTBA 2.5/5-G-5.08/AU | |
| | CAN-Bus Cable: | 5-contact plug (female contacts)<br>Phoenix Contact MSTB 2.5/5-ST-5.08/AU (included) | |
| | WRC-CANX-NEM | | |
| | Extender: | Woodhead # 51354, female sockets, female threads<br>Woodhead # 1R5006A17A120, male pins, male threads | |
| | CAN-Bus Cable: | See accessories list | |
| **Status Indicators**: | Module Status: | green/red bi-color LED | |
| | Network A Status: | green/red bi-color LED | |
| | Network B Status: | green/red bi-color LED | |
| | Diagnostic Data: | green/red bi-color LED | |
| **Voltage Isolation**: | 2500 V | | |
| **Maximum power**: | Voltage: | 11 - 25 Vdc | |
| | Current: | Network A: | 140 mA @ 11 Vdc - 60 mA @ 25 Vdc |
| | | Network B: | 20 mA @ 11 Vdc - 10 mA @ 25 Vdc |
| | Power: 1.8 W | | |
| **Mounting**: | WRC-CANX-DIN: | DIN rail mount, EN 50022 | |
| | WRC-CANX-NEM: | Panel-mount, 4 screws | |

| **Size**: | WRC-CANX-DIN | WRC-CANX-NEM |
|---|---|---|
| Length: | 4.32" (110 mm) | 5.11" (130 mm) |
| Depth: | 1.79" (45,5 mm) | 2.27" (57,7 mm) |
| Height: | 3.44" (87,4 mm) | 3.70" (94,0 mm) |

| | |
|---|---|
| **Operating Temp**: | 0-70 ºC |
| **Humidity**: | 0-95% RH, non-condensing |

# 5. Hardware Installation and Configuration

## *5.1. Overview*

A CAN-Bus Extender is a single device connecting to two parts (sub-network) of a single CAN-Bus network. The CANX-DIN is to be mounted on an EN50022 DIN rail (available from WRC and WRC's distributors as part number WRC 50022) in any orientation. The CANX-NEM is a NEMA-4X polycarbonate enclosure and is panel mounted.

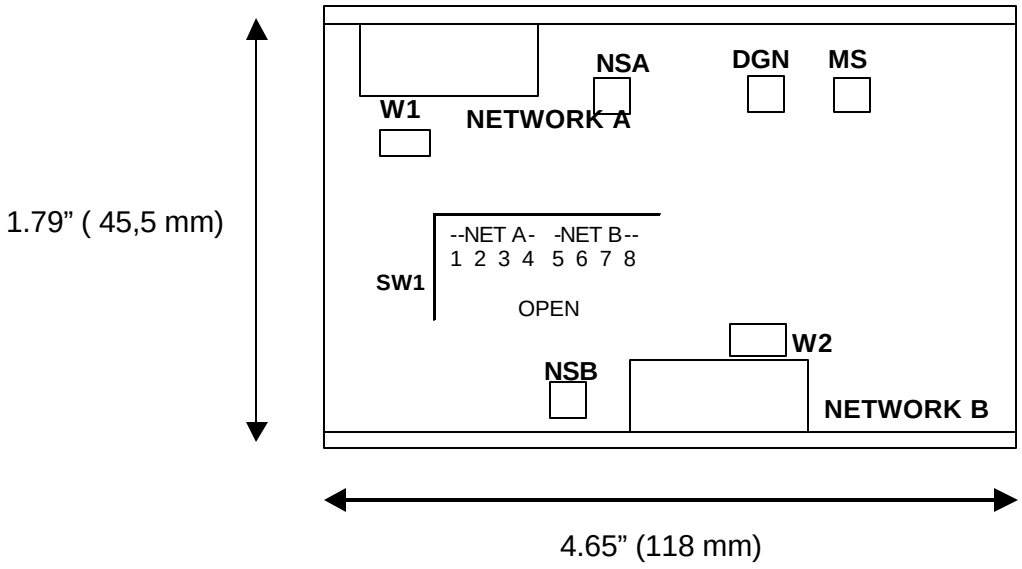


Figure 5-1 WRC-CANX-DIN Series 3 Dimensional Drawing

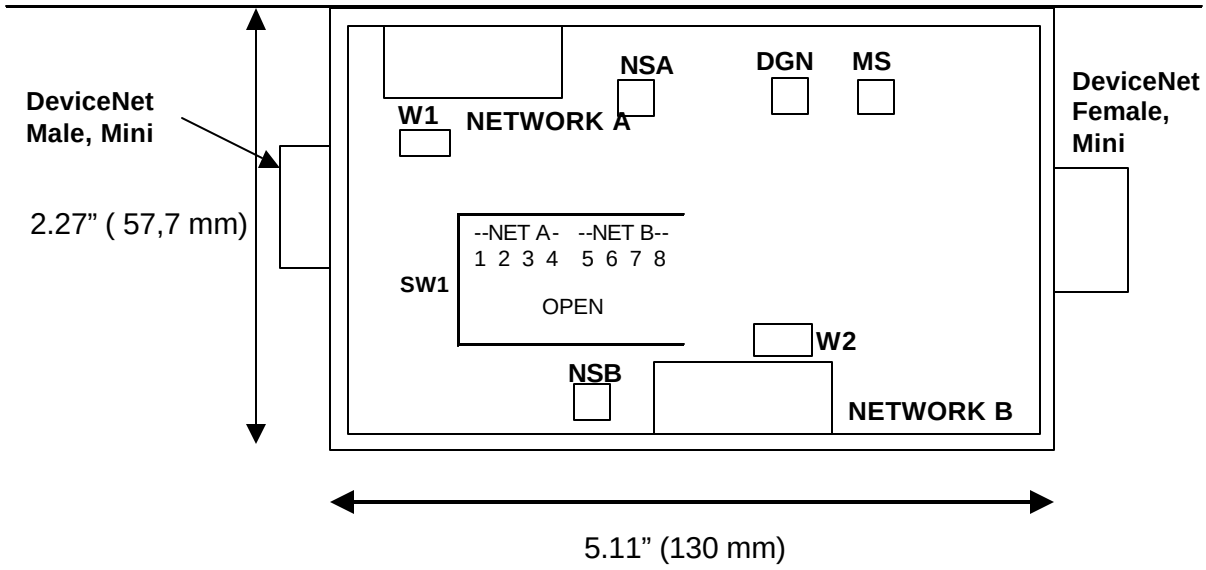


Figure 5-2 WRC-CANX-NEM Series 3 Dimensional Drawing

## *5.2. DIP Switch Settings*

The WRC-CANX-XX has an 8-pole DIP switch.

- Switch positions 1-4 are used to set the Network A baud rate.
- Switch positions 5-8 are used to set the Network B baud rate.

The baud rates can be set independently, or one side can take its baud rate from the other side (in the "Remote" setting).

Table 5-1 Baud Rate Settings for Switches

| Baud rate | Side A<br>Side B | Position 1<br>Position 5 | Position 2<br>Position 6 | Position 3<br>Position 7 | Position 4<br>Position 8 | Meaning |
|---|---|---|---|---|---|---|
| 125K | | CLOSED | CLOSED | CLOSED | CLOSED | Fixed |
| 250K | | CLOSED | CLOSED | CLOSED | **OPEN** | Fixed |
| 500K | | CLOSED | CLOSED | **OPEN** | CLOSED | Fixed |
| Autobaud | | CLOSED | CLOSED | **OPEN** | **OPEN** | Autobaud |
| Remote | | **OPEN** | **OPEN** | **OPEN** | **OPEN** | Takes baud rate from opposite side setting. If both sides are remote, Autobaud from either side. |
| N/A | | | | | | Reserved for future use |

## *5.3. LED Operation*

The WRC-CANX-XX Multiplexer has four (4) LED's that provide visual status information to the user about the product and the DeviceNet network. See Figure 5-1, Table 5-2, Table 5-3 and Table 5-4.

Table 5-2 Module Status LED (labeled MS)

| LED State | Module Status | Meaning |
|---|---|---|
| OFF | No Power | There is no power through DeviceNet. |
| Green | Device Operational | WRC-CANX is operating normally. |
| Flashing Red | Minor Fault | Advanced Memory Technology (AMT) buffers space exceeded. |
| Red | Unrecoverable Fault | WRC-CANX may be damaged. |
| Flashing Red/Green | Device Self-Testing | WRC-CANX is in self-test mode. |

Table 5-3 Network Status LED's (labeled NSA and NSB)

| LED State | Module Status | Meaning |
|---|---|---|
| OFF | No Power / Not on-line | WRC-CANX has no power or device is not operating. |
| Flashing Green | Idle | WRC-CANX has not received a valid message for 0.5 sec. |
| Fast Flashing Green | Autobaud selection | The WRC-CANX is waiting for a valid message to fix the baudrate. |
| Green | On-line | WRC-CANX is operating normally. |
| Flashing Red | CAN controller buffer overflow | There is more traffic on the network than the system can handle. |
| Red | Critical link failure (Bus Off) | WRC-CANX has detected an error that makes it incapable of communicating on the link. |

Table 5-4 Diagnostic Status LED's (labeled DGN)

| LED State | Module Status | Meaning |
|---|---|---|
| OFF | Normal operation | No Power, or<br>Normal Operation with power applied. |

## *5.4. Power Requirements*

The WRC-CANX-XX CAN-Bus Extender subsystem is powered from the 11-25 Vdc provided by the DeviceNet network. The WRC-CANX consumes 70 mA of current at 24 Vdc, or 1.8 Watts, typical. See Section 4.

Power is typically taken from the bus on each side and each side (A and B) requires power. Power applied to the A Side powers the entire unit except the B Side isolated transceiver. If isolation is not required for your application, then the power line may be jumpered from side A to side B. Care must be taken that the power supply is capable of handling the entire load on both sides of the CANX.

## *5.5. Network Cabling and Configuration*

This section provides general guidelines for connecting DeviceNet and SDS systems. You can find detailed specifications in the appropriate ODVA DeviceNet and Honeywell SDS specifications.

### 5.5.1. Cable Lengths

The following provide cable length limits for DeviceNet and SDS systems.

Table 5-5 Network Maximum Lengths - DeviceNet

| Baud Rate | Trunk Line Length | | Drop Length | | | |
|---|---|---|---|---|---|---|
| | Maximum Distance | | Maximum | | Cumulative | |
| | Meters | Feet | Meters | Feet | Meters | Feet |
| 125 Kbits/s | 500 m | 1640 ft | 6 m | 20 ft | 156 m | 512 ft. |
| 250 Kbits/s | 250 m | 820 ft | 6 m | 20 ft | 78 m | 256 ft. |
| 500 Kbits/s | 100 m | 328 ft | 6 m | 20 ft | 39 m | 128 ft. |

DeviceNet has a limit of 64 nodes per network for any baud rate. The CANX does not count as an addressed device.

Table 5-6 Network Maximum Lengths - SDS

| Baud Rate | Trunk Line Length (maximum) | | Drop Length (maximum) | | No. Nodes |
|---|---|---|---|---|---|
| | Meters | Feet | Meters | Feet | |
| 125 Kbits/s | 457.2 | 1500 | 3.6 | 12 | 64 |
| 250 Kbits/s | 182.8 | 600 | 1.8 | 6 | 64 |
| 500 Kbits/s | 91.4 | 300 | 0.9 | 3 | 64 |
| 1 Mbits/s | 22.8 | 75 | 0.3 | 1 | 32 |

SDS has a limit of 32 nodes per network for any baud rate. The CANX does not count as an addressed device.

### 5.5.2. Network Termination

A CAN-Bus system **must be terminated at each end of the trunk line**. The host controller and the **last** device (CAN-Bus Extender or other DeviceNet node) on the network section must always be terminated to eliminate reflections, even if only two nodes are present. Follow the information below when using a CANX.

The CANX Series 3 has built-in terminators which can selectively included or omitted from the network. To include the on-board terminator on side A, install jumper W1; or remove the W1 jumper if the on-board terminator in not desired. For the side B sub-network, install or remove jumper W2. The CANX is shipped from the factory with the jumpers installed.

**Trunk line use**

For the purpose of network termination, the CANX is treated as the last node on the section of the trunk network to which it is connected. Therefore, when a CANX is used directly in a trunk line, it must be terminated on both the Network A and Network B sides. You must also place a terminating resistor on the other end device of Network A and on the last device on Network B side of the trunk line.

**Drop line use**

When CANX is used in a drop line (the Network A side is toward the main trunk), the Network A connection is **not** terminated. In this configuration the Network B section is considered as an independent bus line electrically. The CANX, as the first node in this new bus line and must be terminated, and the last device on the line must also be terminated.

Some specifications for the terminating resistor are:

Table 5-7 Terminating Resistors

| DeviceNet | SDS |
|---|---|
| 121 ohm<br>1% metal film<br>1/4 watt | 120 ohm<br>2%<br>1/4 watt |

**Important**: Per the DeviceNet and SDS specs -- do not terminate devices on drop lines.

An appropriate terminating resistor kit, WRC part number RM121DN, which satisfies both DeviceNet and SDS specs, is included with your Extender.

**Note**: The WRC-CANX Series 3 family is configured at the factory with 2 **internal terminating resistors** on each network – one for Network A and one for Network B – using jumpers W1 and W2. If these are used in a trunk line, no other terminators should be placed at the CANX that end of the network.

**Note**: If the CANX is used on a **drop line**, the internal terminating resistor should be removed on Network A – the drop line directly from the trunk line.

### 5.5.3. DeviceNet Connection Wiring

The supplied 5-pin CAN-Bus connection plug accepts cable sizes from 12 AWG - 24 AWG. The maximum wire size (12 AWG) has an area of 6530 circular mils and the smallest (24 AWG) has an area of 3265 circular mils.

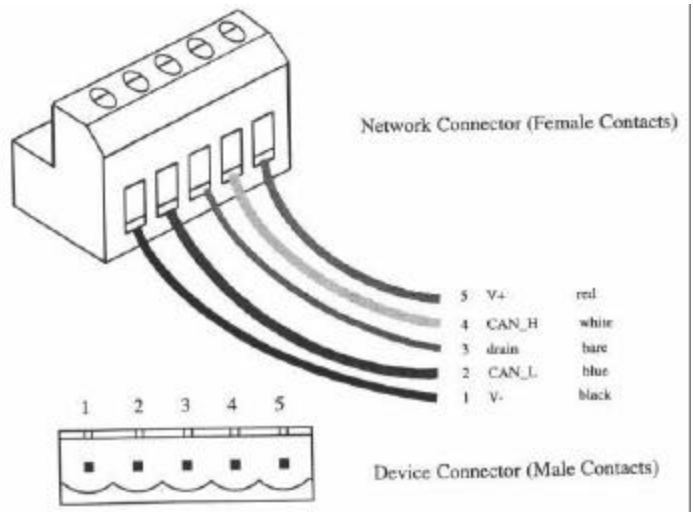


Figure 5-3 WRC-DANX-DIN-DN DeviceNet cable connector

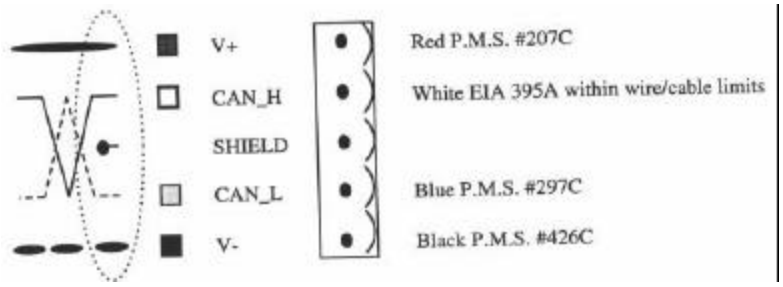


Figure 5-4 DeviceNet cable specifications

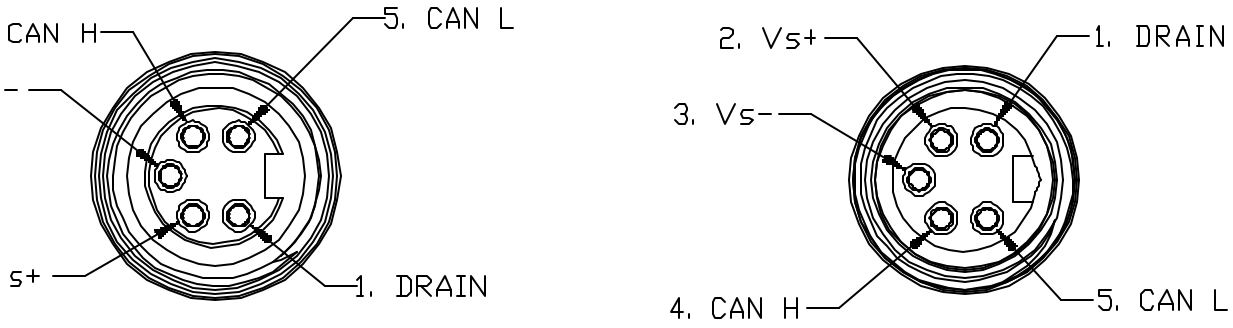


Figure 5-5 WRC-CANX-NEM DeviceNet Connectors

### 5.5.4. SDS Bus Connection Wiring

The supplied 5-pin CAN-Bus connection plug accepts cable sizes from 12 AWG - 24 AWG. The maximum wire size (12 AWG) has an area of 6530 circular mils and the smallest (24 AWG) has an area of 3265 circular mils.

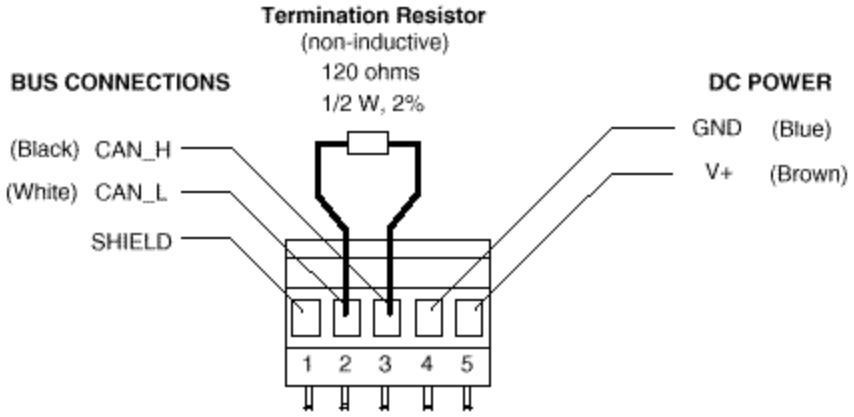


Figure 5-7 SDS Plug Connector

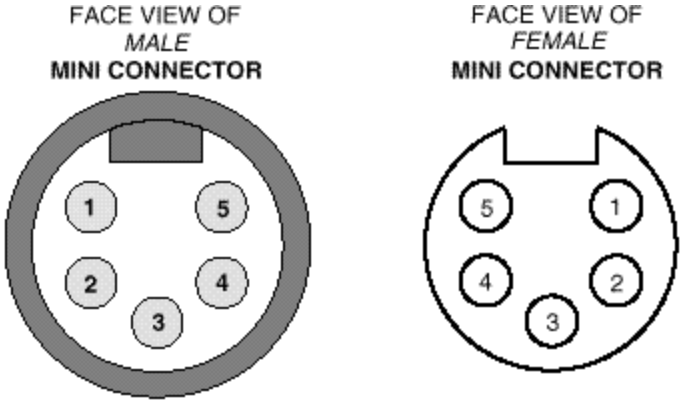


Figure 5-6 SDS Mini Connector

# 6. Operation

The CANX accepts and stores messages received at either network connection and actively re-transmits the messages to the other sub-net while providing 2500V isolation between the two sections of the network. The two bus connections for each CANX are referred to as Sub-Network A and Sub-Network B, and the two sub-nets are one logical network with isolation between them. The CANX may be used to extend the maximum distance that a network can operate at any given speed. That is a CANX may be used

- to extend the network beyond its absolute maximum length (e.g., 500 meters for DeviceNet) at the slowest speed
- to implement a longer network for a given baud rate (e.g., pushing a 500K baud network beyond 100 m for DeviceNet)
- to provide higher speed baud rates for a given network length
- to extend the length of the drop cable (e.g., longer drops than 6 m for DeviceNet)
- provide 2500V electrical isolation between the 2 sub-nets

The CAN Bus is connected to each side of the CANX and each side receives its power and signals from the Bus on its respective side.

Whenever a message is transmitted on the Bus to which CANX is connected, CANX receives the message on the side where it was initiated and performs a store-and-forward of the message to the other side. This action is performed for any valid CAN message independent of who generated it or to whom it is addressed.

The CANX is not addressed as a specific device on the Bus and cannot be interrogated by other nodes. It is transparent to all other nodes on the bus.

## *6.1. Application Notes*

To help insure ease of installation and reliable operation of your system, the following guidelines should be followed CANX installation in your CAN network.

1. You may install the Network A side or B Side of CANX toward the Bus Master.
2. The CANX takes its logic power from the A Side, but you may power up the CANX from either side first.
3. There is approximately a 75 µsec propagation delay of the message through the CANX.
4. **In autobaud mode**, each side can autobaud from the other side or from the first message on its own side.
5. CANX is not a grounded device and the Bus shield is not connected electrically to the device. Therefore, follow appropriate wiring practices to eliminate noise and other problems.

### 6.1.1. CANX Theory of Operation

As described the CANX performs a store-and-forward operation on each message received. The operation is described in this section.

The CANX will verify and accept (consume) on either network side any and all valid CAN messages. The message will be momentarily stored internally and the CANX will immediately attempt to re-send (produce) the message on the other side bus. Because the other side of the CANX is a different bus electrically and from a data link perspective, it will perform a negotiation session on that bus section to retransmit (produce) the message onto that section. This action has the effect of doubling the overall number of total attempts to get onto the bus of each message. This is the case because every message is reproduced independent of where the target node exists; that is, the CANX does not interrogate the message to determine the target node and does not know physically where the target node is connected.

As the bus negotiation is performed on the second side, the retransmitted message may or may not get on the next bus section immediately. That will depend solely upon the priority of the message the CANX is sending with respect to the messages being generated by nodes on that side of the bus and on the amount of overall bus traffic on that side. In the case where the CANX does not immediately win the negotiation it stores the messages and attempts to resend it in the same fashion as any other device on the network. To the extent that it cannot produce immediately the message will be stored in an internal buffer until it can be sent.

As other messages arrive at the CANX they also are put into an internal buffer and retransmitted as quickly as possible. The internal buffers (one for each side) are FIFO buffers so that the messages for each side will be retransmitted in the order that they are received with respect to the other messages received on the same side. Up to 100 messages can be held in the internal AMT buffers.

### 6.1.2. Network Throughput Design Considerations

The effect of the operations described above and the internal propagation delay inside the CANX (approximately 75us) as it performs the store-and-forward is that it may be possible to design a network with more traffic that the CANX can be expected to handle. Care should be taken to design the network so that the amount of total traffic does not exceed the capabilities of the total system. Each application and installation has its own requirements and configurations so a definitive formula would be very difficult to define. However, a good rule of thumb would be to set up the scan time for a network that includes a CANX that is no faster that twice the fastest scan time possible to achieve the desired communications that may be obtained without the CANX.

In the event that the network operation prevents all messages on one side from getting out before the buffer on that side fills, subsequent messages will be lost. The CANX will continue to process transmitting all stored messages and will accept new messages once room clears in the buffer. The red LED labeled NSA or NSB will illuminate and will remain illuminated for 5 seconds after the "buffer full" condition clears.

### 6.1.3. Fixed Operation

Fixed baud rate operation has the specific advantage that it can be used in networks where all devices on one are autobaud only.

The baud rate is set by setting SW1 switch positions before powering up the A side of the CANX. See Table 5-1.

### 6.1.4. Autobaud Operation

Autobaud is the method by which a device automatically determines the baud rate on the DeviceNet network and sets it's internal baud rate to match without the need for switches or software configuration. The CANX supports autobaud.

Autobaud operation has the advantage of allowing a system implementer or designer to ignore the operating baud rate when installing the CANX. The general practice is that when an I/O device is autobaud, it does not transmit a DupMacID request message immediately upon power up. It waits for another (fixed baud rate) device to send its DupMacID message in order use that message to determine to which baud rate the network has been set.

Since the CANX is not a logical node on DeviceNet, it does not initiate any DeviceNet communications. When both the A and B sides are set to autobaud, a valid message on either side will be used to set the baud rate on both sides. In addition, that message is transmitted out the other side of the network to the nodes there, from which they can establish their baud rates if in autobaud.

In the case where no device that initiates this DupMacID sequence, all the autobaud devices will just wait for some valid message to be generated.

The CANX baud rate is set by setting SW1 switch positions before powering up the A side of the CANX, as defined in Table 5-1.

# 7. Example Configurations

Examples of valid configurations are shown in the following figures. The first example shown demonstrates a standard linear bus structure for comparison.

- Linear Bus Topology

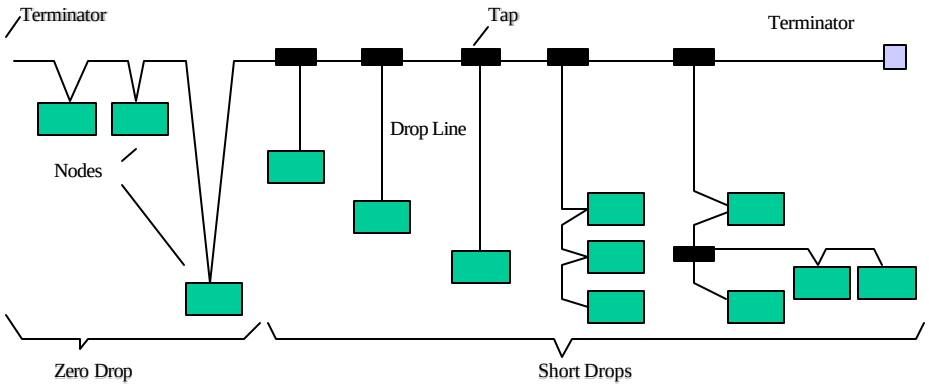


Figure 7-1 Linear Topology Example

- Linear Bus Topology - distance doubled

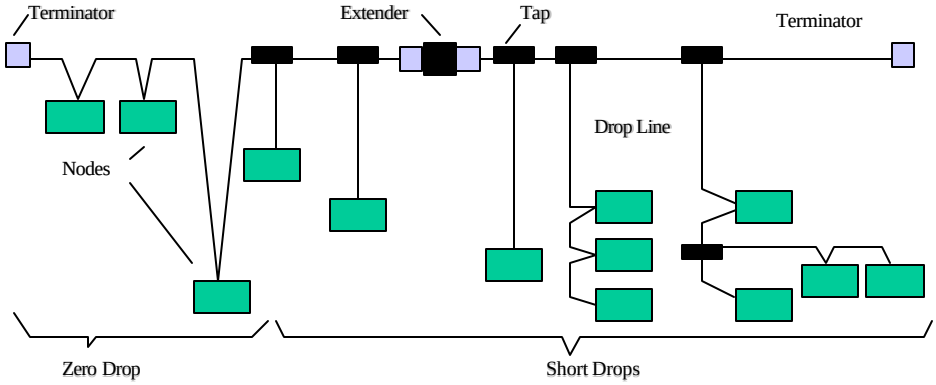


Figure 7-2 Linear Topology with Double Distance Example

- Linear Bus Topology - multiple Extenders

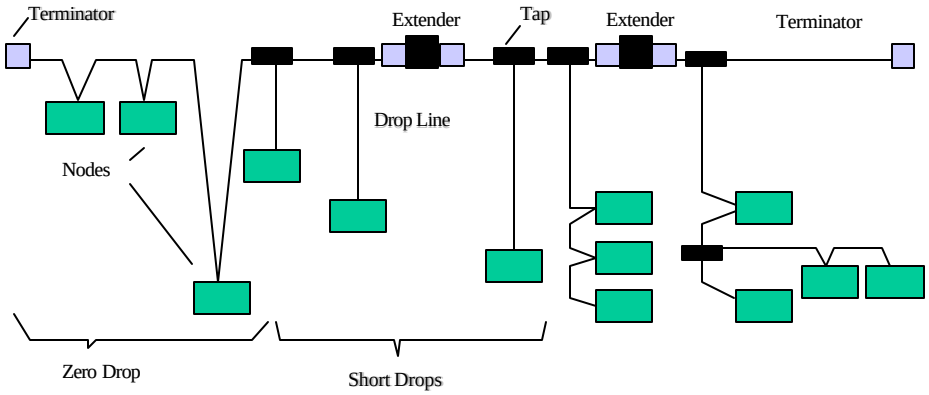


Figure 7-3 Linear Topology with Multiple Extenders Example

- Linear Bus Topology - multiple extended drop lines

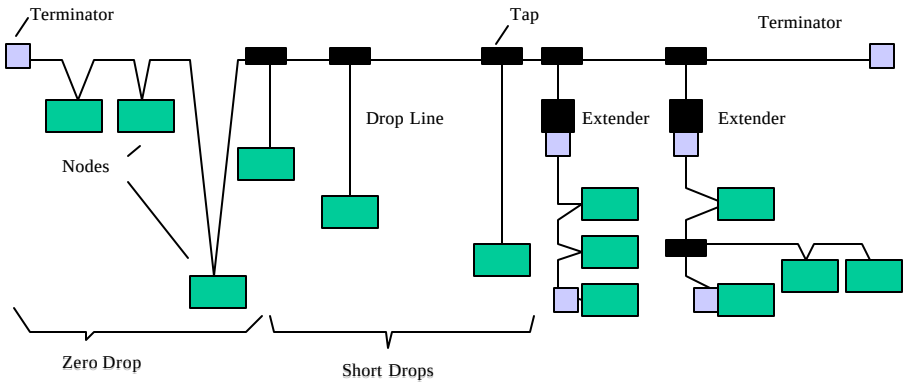


Figure 7-4 Linear Topology with Multiple Extended Drop Lines Example

- Modified Star Topology - multiple extended drop lines

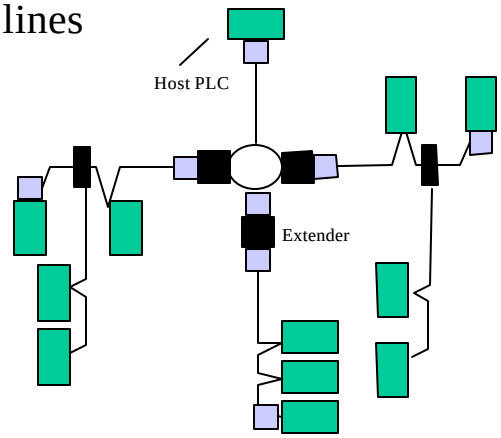


Figure 7-5 Star Topology with Multiple Drop Lines Example

# 8. Accessories and Other CAN Products

The following components can be used with a WRC-CANX CAN-Bus Extender for replacements or spare parts.

| Part | WRC P/N | Equivalent Mfr. Part Number |
|---|---|---|
| • CANX-DIN Link Connector and Terminator Resistor | CANX-DN-CK | Phoenix Contact MSTB2.5/5-ST-5.08/AU |
| • CANX-NEM Cable | n/a | Various manufacturers' Mini-Style Connector<br>Examples:<br>Cable assy. w/ female threads, fem. sockets:<br>Turck RKM 570-*M/630 ("trunk line")<br>Turck RKM 571-*M/630 ("drop line")<br>Cable assy. w/ male threads, male pins:<br>Turck RSM 570-*M/630 ("trunk line")<br>Turck RSM 571-*M/630 ("drop line") |
| • DIN rail (1 meter) | WRC 50022 | Phoenix Contact NS 35/7,5 0801733 (2 m)<br>Allen-Bradley 199-DR1 (1 m) |

WRC also provides discrete and analog I/O signal conditioning and multiplexing on DeviceNet, as well as communication gateways. See

Table 8-1 Additional WRC DeviceNet Products

| Part | WRC Part Number |
|---|---|
| DIN rail | WRC 50022 |
| Terminating resistor, axial lead | RM121DN |
| Connector, 5-pin mini-round for CANX, CANR | B 4151-0/16 (Turck) |
| Discrete I/O block – 4 channels | 1782-JDB4 |
| Discrete I/O block – 8 channels | 1781-JDB8 |
| Analog Input block – 4 channels, 10-bit | 1782-JDA4 |
| Analog I/O block – 8 channels, 12-bit | 1782-JDA8 |
| DeviceNet to Serial I/O Gateway | 1782-JDC |
| DeviceNet to Serial I/O Gateway, Enhanced | 1782-JDCE |
| DeviceNet-to-Serial I/O Gateway, 4 channels | W5-JDC4 |
| DeviceNet to Modbus Gateway | 1782-JDM |
| Discrete I/O block – 24 channels | WRC1-JDB24 |
| Discrete I/O block – 48 channels | WRC1-JDB48 |
| Discrete I/O, Analog Input block – 24 DIO, 32 AI | WRC1-JDA/24 |
| Discrete I/O, Analog Input block – 48 DIO, 32 AI | WRC1-JDA/48 |
| Analog I/O block - 32 channels | WRC1-JDAIO |
| Discrete and Analog I/O block – 24 DIO, 32 AIO | WRC1-JDAIO/24 |
| Discrete and Analog I/O block – 48IO, 32 AIO | WRC1-JDAIO/48 |
| Discrete I/O block – 8 DIs, 8 DOs, 4 AIs | W5-JDB16x |
| DeviceNet, CANopen Extender, DIN mount | WRC-CANX-DIN-DN |
| SDS Extender, DIN mount | WRC-CANX-DIN-SD |
| DeviceNet, CANopen Extender, DIN mount | WRC-CANX-DIN-C7 |
| DeviceNet, CANopen Extender, NEMA box | WRC-CANX-NEM-AU |
| DeviceNet, CANopen Extender, NEMA box | WRC-CANX-NEM-DN |
| SDS Extender, NEMA box | WRC-CANX-NEM-SD |
| DeviceNet, CANopen Extender, Fiber Optic, NEMA box | WRC-CANR-DF-DN |

# 9. Troubleshooting

This section identifies some of the common problem observed when commissioning or operating a CANX Extender.

Problem:

DeviceNet devices will not communicate on the network
Module Status LED is solid Green
Network Status LEDs are flashing Green at ½second intervals

Meaning

No transmissions have been received by the CANX for 0.5 seconds.

Possible Solutions:

1. Network cables are broken or disconnected.
2. Network is not properly terminated.
3. All devices have stopped trying to communicate on the network.
4. Power has been lost on the B Side subnetwork.

Problem:

DeviceNet devices will not communicate on the network
Module Status LED is solid Green
Network Status LEDs are flashing Green quickly

Meaning

The CANX is in autobaud and is waiting for a valid message to fix its baud rate.

Possible Solutions:

1. Network cables are broken or disconnected.
2. Network is not properly terminated.
3. All devices have stopped trying to communicate on the network.

Problem:

Some messages are missed on network.
Module Status LED is solid Green
NSA and NSB LEDs are flashing Red

Meaning

Internal CAN buffers are full. Network has more traffic than it can handle.

Possible Solutions:

1. Reduce the scan rate from the Master.
2. Reduce the COS frequency on I/O devices.
3. Decrease the assembly sizes of I/O connections.
4. Recalculate the network traffic and bandwidth without the CANX.

Problem:

Some messages are missed on network.
Module Status LED is solid Green
NSA and NSB LEDs are flashing Red

Meaning

Internal AMT buffers are full. Network has more traffic than it can handle.

Possible Solutions:

1. Reduce the scan rate from the Master.
2. Reduce the COS frequency on I/O devices.
3. Decrease the assembly sizes of I/O connections.

4. Recalculate the network traffic and bandwidth without the CANX.

# 10. Summary of Changes to Series 3 from Rev 2

To facilitate implementation of the new Series 3 CANX products for customers that are currently users of the CANX Revision 2.xx products, this section summarizes the product changes from Rev 2 to Series 3.

## *10.1. DIP Switch Baud Rate Settings*

Several new options exist for setting the baud rate on the CANX Series 3.

- The Series 3 has an 8-position DIP switch block. All 8 switches are defined and used.
- Both sides' baud rates can be set up independently.
- A "remote mode" exists which allows either side to set its baud rate based on the other side's BR – in either fixed baud or autobaud.
- See Section 5.2 above for details.

## *10.2. Indicator LED's*

The definition of some states of the LEDs have changed. Refer to Table 5-2, Table 5-3 and Table 5-4 for details.

## *10.3. Terminating Resistors*

The Series 3 has an on-board terminating resistor on each CAN connection that can be selectively included or excluded from the network circuit. With jumpers W1 and/or W2 in place, the CANX puts a 121-ohm resistor across the CAN_H and CAN_L lines on sub-network sides A and/or B. See Figure 5-1and Figure 5-2 for the location of these jumpers.

## *10.4. Field Programmable Updates*

The CANX Series 3 has its program held in flash memory, which can be updated in the field. Contact the factory for details.